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Predator densities and associated salmonid smolt mortality around water diversions

Abstract: State-of-the-art fish screens on large water diversions effectively prevent juvenile salmon from being entrained by the diversion, but the physical structure and their prey-concentrating effect may attract predators and create a local predation problem. We are assessing the impact of predation near two large water diversions on Central Valley Fall and Spring run Chinook salmon (*Oncorhynchus tshawytscha*) using a combination of acoustic telemetry, a DIDSON camera, and tethering. We expect to answer these questions:

(1) Does water entrainment and/or the physical structure of the diversions create smolt aggregations?
(2) Is predator density higher near water diversions relative to nearby areas?
(3) Do predators express site fidelity to the diversions? Where do they go when they leave?
(4) Is the relative smolt predation rate near the diversions higher than nearby areas? What about seasonal and diel predation rate dynamics?
(5) What proportion of the predators' diets consists of smolts near the diversions?
(6) All factors combined, does this result in higher than average smolt mortality rates near the diversions?

During a pilot season in 2011 using just one diversion on the Sacramento River, we gained limited insight into these questions. Predator densities were lowest near the diversions, and highest near the riverbank. Striped bass (*Morone saxatilis*) did not seem to express site fidelity while Sacramento pikeminnow (*Ptychocheilus grandis*) did. Finally, relative predation rates around the diversions were near the average, with the highest relative predation rates found near the riverbank.

Statement of Relevance: This project was conceived in response to the knowledge gap regarding how large water diversions influence predator-smolt dynamics; the majority of research on the impacts of diversions on salmonids concentrate on dewatering and lethal entrainment into pumps. This project may also provide valuable information on how to improve future diversions.